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OCCULAR REFRACTOMETER

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OCCULAR REFRACTOMETER

[Augenrefraktometer]

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The invention concerns an ocular refractometer for the objective refraction determination /1* of the eye with an optometer system for picturing a test mark on the retina of the subject, having an observation system for the test mark and a sighting system for aligning the refractometer to the patient's eye.

The spherical and cylindrical effects of the spectacle lens and its axial position are determined with such ocular refractometers. A reliable, rapid and fatigue-free procedure with the ocular refractometer is primarily required by the user.

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* [Numbers in right margin indicate pagination of the original text.]

An ocular refractometer that partially meets these requirements is known from the prospectus 369 – 2d/4 – 1.75 Mehd. of the Rodenstock firm. However, the device has eyepieces for the distance measuring scale and for observing the test figure and reading the scale that are spatially separated from each other so far apart that a repeated change of position of the observer is necessary during the measurement. Furthermore, the operational controls in this known device are not optimally arranged, i.e., (as seen by the observer) it has on its right-hand side a turning knob for diopter adjustment and on its left-hand side a turning knob for adjusting the main intersecting position. Since the measurement with the ocular refractometer is a dynamic process in vivo (i.e., the instrument pupil has to be repeatedly returned to the pupil of the eye of the subject during the measuring process), the observer, one hand of whom must remain on a coordinate control level for adjusting the device, has to turn from one side of the device to the other repeatedly in the optical measuring process.

The invention has the task of offering an ocular refractometer that permits a more reliable, more rapid and more fatigue-free operation than the known device.

This problem is solved according to the invention in that a binocular observation tube is /2
provided, through one eyepiece of which the retinal image of the test mark is observed and the other eyepiece of which serves for centering the ocular refractometer to the pupil of the eye of the subject and optionally the observation of a distance measuring scale for the corneal vertex distance, or facilitates an axial scheme (tabo) for the main section position adjustment and a diopter scale. Digital measurement displays are provided in one embodiment example for the diopter scale and the tabo scale.

The operational controls for the diopter adjustment of the device and for adjusting the main intersection position are advantageously arranged coaxially to each other.

In an expedient embodiment example the coaxial operating controls are placed on both sides of the ocular refractometer and thus can be optionally operated with the left or right hand.

For actuating a dual-diaphragm mechanism inside of the device, with which the image is determined in the eyepiece serving for scale observation, a lever with three stop settings that is to be operated on both sides of the device is expediently provided.

The advantages achieved with the invention consist in particular in that the entire examination can be done in one observation and without any change of position of the persons participating through the binocular viewing. The corneal vertex distance can be selected between 10 and 18 mm and is determined according to the eye position of the subject or suitable for fitting of eyeglasses. Due to the coaxially arranged turning knobs for determining the diopter values and the axial position, repeated movement during the measurement is avoided.

An exemplary implementation for the invention is shown in the drawings and is described in more detail in the following.

Figure 1 shows the invention ocular refractometer in perspective view.

Figure 2 shows the optical beam path in the ocular refractometer shown in Figure 1 in /3
schematic representation.

The binocular observation tube with the eyepieces 1a and 1b is designated by 1 in Figure 1. The coaxial operational control located on the left side of the device, as seen by the user, for diopter adjustment and main section position adjustment are designated by 6 and 5. A switch lever that has three stop positions and can be seen on the left side is designated by 7. In the first position a scale for the corneal vertex distance and an image of the iris as well as the pupil of the eye are visible in eyepiece 1b, the display scales for diopters and axial position are visible in eyepiece 1b in the second stop position, and the visual field is covered in eyepiece 1b in the third stop position. The forehead and chin supports for the subject are designated by 8 and 9. 10 is the height-adjustable carrier for the chin support. The adjustment for the corneal vertex distance (HAS) can be fixed with the set screw 11. A coordinate control lever known in itself, with the aid of which the ocular refractometer can be moved in all three coordinates, is designated by 12. The set screw 13 serves to fix the instrument base 15 on the ground plate 14. In addition, a brightness regulator for illumination is provided in 16 and a red filter insertable into the beam path is provided in 17. The operational controls 5, 6, 7 are also provided on the right-hand side of the device.

The halogen lamp provided for illumination and picturing of the test figure 2 is designated by 18 and collector by 19 in Figure 2. The prisms 20, 21 serve to deflect light. The lens 22 that can be shifted vertically pictures the test figure 2 in the intermediate image plane 2'. The ophthalmoscope lens 24 projects the intermediate image 2' on the retina 2" of the subject. The precisely defined exit pinhole of the illumination is depicted in the half-used pupil of the eye of the subject in the beam path itself. In the observation beam path that is separated geometrically from the image beam path by means of the beam partition prism 23, the retinal image of the test figure 2" is picked up by the ophthalmoscope lens 24 and again appears in the intermediate image plane 2'. After reflection on the beam partition prism 23, the lens 25 can be shifted in the direction of the arrow synchronously with the lens 22 and the retinal image depicts /4
the test figure in the eyepiece plane 1a of the right-hand observation tube.

For adjusting the corneal vertex distance (HAS) and for reading the diopter and tabo scales, the lens 26 reproduces the iris and the pupil of the eye 3 of the subject in the scale plane 4 of the distance measurement. The scale 27 for the diopter display and the scale 28 for the main section position (tabo scale) are located in the same plane. The scales are observed through the left-hand eyepiece 1b of the binocular tube. Test figure 2 and tabo scale 28 are simultaneously adjustable in the direction of rotation 29.

The ocular refractometer thus facilitates reading the preselected, defined distance between the spectacle glass vertex close to the eye and the corneal vertex of the subject ("HAS adjustment"). Furthermore, the left-hand eyepiece in another stop position of the lever 7 facilitates the reading of, e.g., the digitally displayed measurement scales (diopter and main section scales) for the preselected corneal vertex distance. The corneal image 2" of the test figure 2 is observed by the examiner through the right-hand eyepiece, independently of the position of the lever 7. The visual impressions of the right-hand eyepiece 1a and of the left-hand eyepiece and 1b blend into one visual image during the observation.

The diopter adjustment 6, with which the small turning knob disengages by the effects of the main section position adjustment, is effected with the large turning knob designated by 5 in Figure 1. The distance measurement scale (HAS adjustment) is visible in the first stop position oriented to the observer in the left-hand eyepiece with the switch lever 7. At the same time, the presentation of a round luminous field as an adjusting aid for the centering of the "exit pinpoint of the illumination to the pupil of the subject" on the iris of the subject's eye is observed. If the lever 7 is placed in the middle stop position, the distance measuring scale is covered by a diaphragm mechanism (not shown) and the two scales 27 and 28 are exposed in the left-hand eyepiece. The corresponding two scale windows are illuminated. In the third stop position of the switch lever 7, which is oriented away from the observer, the said diaphragm mechanism /5
completely covers the visual field of the left-hand eyepiece; the illumination functions of the above lever positions are switched out. The picturing of the retinal image of the test figure is then visible only in the right-hand eyepiece. An influence on the repetition adjustments is to be avoided by this measurement without the presentation of scales.

The retinal image 2'" of the test mark 2 is visible in the right-hand eyepiece in each position of the switch lever 7.

Claims /6

1. Ocular refractometer for the objective refraction determination of the eye having an optometer system for depicting a test mark on the retina of the subject with an observation system for the test mark and a sighting system for orienting the refractometer to the subject's eye, characterized in that a binocular observation tube (1) is provided, through an eyepiece (1a) of which the retinal image (2") of the test mark (2) is observed, and the other eyepiece (1b) serves for centering the ocular refractometer to the pupil of the eye (3) of the subject and optionally facilitates the observation of a distance measuring scale (4) for the chosen retinal vertex distance or an axial scheme (28) (tabo) for main section position adjustment and a diopter scale (27).

2. Ocular refractometer according to Claim 1, characterized in that the operational controls (5, 6) for diopter adjustment and adjustment of the main section position are arranged coaxially to each other.

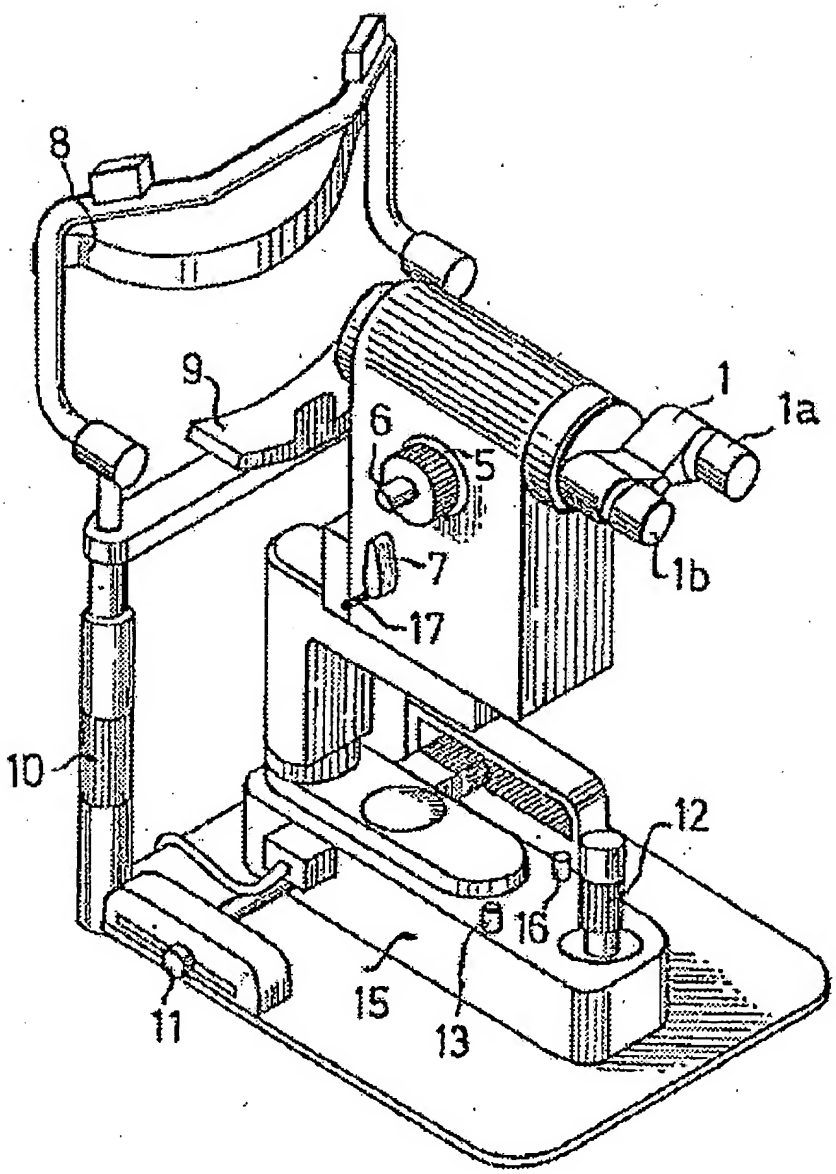
3. Ocular refractometer according to Claim 2, characterized in that the coaxial operational controls (5, 6) are placed on both sides on the ocular refractometer.

4. Ocular refractometer according to Claim 1, characterized in that a digital display device is provided for the measuring scales (27, 28).

5. Ocular refractometer according to one of Claims 1-4, characterized in that a lever (7) is provided with three stop positions for actuating a dual-diaphragm mechanism inside of the device.

6. Ocular refractometer according to Claim 5, characterized in that the lever (7) is provided on both sides of the device.

Fig.1



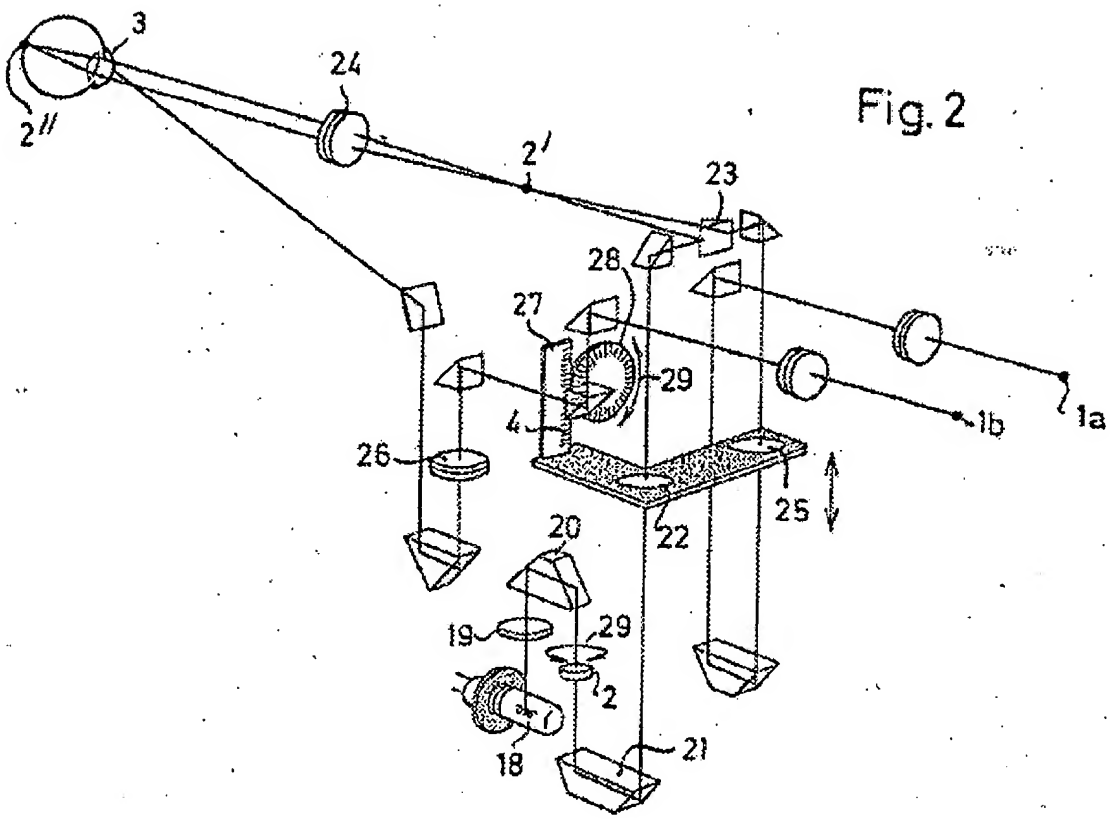


Fig. 2

European Patent Office
EUROPEAN SEARCH REPORT

Application Number
EP 81 10 2876

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.³)
	FR-A-2 069 843 (THOMSON CSF) * PAGE 2, LINE 1 TO PAGE 3, LINE 3; Figures * --- FR-A-2 365 325 (CARL ZEISS firm) * page 2, lines 8-35; page 3, line 33 to page 4, line 20; page 5, lines 1-18; Figures 1-4 * --- FR-A-1 149 085 (MAISON LUER) * page 1, left column, line 40 to right column, line 35; page 2, left column, lines 51-55; Figures 1-3 * --- DE-C-450 578 (Fa. CARL ZEISS) * page 2, line 103 to page 3, line 41; page 3, line 111 to page 4, line 79; Figures 1-3 * --- DE-B-1 267 877 (P.F.M. GAMBS) * Column 1, lines 27-40; Column 2, line 33 to Column 3, line 45; Column 4, lines 16-28; Figures 1-5 * --- DE-C-205 177 (G. CULVER LTD.) * page 2, lines 26-38; Figure 2 *	1 1 1 1 1 1	A 61 B 3/12 A 61 B 3/10 G 02 B 27/32 TECHNICAL FIELDS SEARCHED (Int. Cl.³) A 61 B 3/10 A 61 B 3/12 G 02 B 27/32 G 02 B 27/34 G 02 B 27/36
The present search report has been drawn up for all claims.			

Place of search	Date of completion of the search	Examiner
The Hague	July 10, 1981	RIEB

CATEGORY OF CITED DOCUMENTS

X: Particularly relevant if taken alone.
Y: Particularly relevant if combined with another document of the same category.
A: Technological background.
O: Non-written disclosure.
P: Intermediate document.

T: Theory or principle underlying the invention.
E: Earlier patent document, but published on, or after the filing date.
D: Document cited in the application.
L: Document cited for other reasons.

&: Member of the same patent family, corresponding document.

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Application Number
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EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.[3])
	US-A-3 830 562 (J.V. McGRANN et al.) * Abstract; Column 3, line 62 to Column 4, line 35; Column 6, lines 3-55; Figure 4 * ---	2, 3	
	US-A-3 824 005 (J.W. WOESTMAN et al.) * Abstract; Column 4, lines 32-51; Column 6, lines 14-54, Figure 4 * ---	4	
	DE-A-1 955 859 (Fa. CARL ZEISS) * Page 5, line 3 to page 7, line 7; page 7, lines 26-31; page 8, lines 10-12; Figures 1-4 * ---	4, 5	
A	GB-A-2 005 436 (CARL ZEISS STIFTUNG) * Abstract; page 1, lines 43-119; page 2, line 50 to page 3, line 18; Figures * ----------	1	TECHNICAL FIELDS SEARCHED (Int. Cl.[3])
The present search report has been drawn up for all claims.			
Place of search	Date of completion of the search	Examiner	

CATEGORY OF CITED DOCUMENTS

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O: Non-written disclosure.
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T: Theory or principle underlying the invention.
E: Earlier patent document, but published on, or after the filing date.
D: Document cited in the application.
L: Document cited for other reasons.

&: Member of the same patent family, corresponding document.